CLAIMS:

1. A sole for an article of footwear, the sole including at least one corrugated layer of a substantially blast and/or fragment resistant material.

2. The sole of claim 1 wherein the corrugated layer is only in the heel of the sole.

3. The sole of claim 1 wherein the corrugated layer is only in the fore portion of the sole.

4. The sole of claim 1 wherein the corrugated layer can extend across a substantial portion of or the entire sole.

5. The sole of any one of the preceding claims wherein the at least one corrugated layer is formed in the sole such that the corrugations extend transversely to the longitudinal axis of the sole.

6. The sole of claim 5 wherein each of the corrugations are at about a right angle to the longitudinal axis of the sole.

7. The sole of any one of the preceding claims wherein the at least one corrugated layer is formed in the sole with a planar layer formed from the blast and/or fragment resistant material disposed on the upper and/or lower sides of each of the corrugated layers.

8. The sole of claim 7 wherein the planar layer is disposed on the upper and/or lower sides of the corrugated layer such that it meets the peaks of some or each of the corrugations of the corrugated layer so as to form at least a first set of a plurality of channels in the sole.

9. The sole of claim 8 wherein the planar layers on the upper and/or lower sides of each of the corrugated layers are formed integrally with the corrugated layer or in fixed attachment with each of the corrugated layers.

10. The sole of claim 1 wherein the sole can have at least one corrugated layer in both a heel portion and a fore portion of the sole.

11. The sole of claim 10 wherein the respective corrugated layers in the heel and fore portions are formed from different materials.

12. The sole of any one of claims 1 to 6 wherein the corrugated layer is formed from a metal-matrix composite material.

13. The sole of claim 12 wherein the metal-matrix composite material is formed from woven or chopped graphite, a ceramic material or a combination of these materials impregnated with an aluminium alloy.

14. The sole of any one of claims 7 to 10 wherein the planar layers disposed on the upper and/or lower surfaces of the corrugated layer are formed from a metal-matrix composite material.

15. The sole of claim 14 wherein the metal-matrix composite material is formed from woven or chopped graphite, a ceramic material or a combination of these materials impregnated with an aluminium alloy.

16. The sole of any one of claims 1 to 6 wherein the corrugated layer is formed from a polymer impregnated or an epoxy resin impregnated composite.

17. The sole of any of claims 7 to 10 wherein the planar layers disposed on the upper and/or lower surfaces of the corrugated layer are formed from a polymer impregnated or an epoxy resin impregnated composite.

18. The sole of claim 11 wherein the corrugated layer in the heel portion is formed from a metal-matrix composite material and the corrugated layer in the fore portion is formed from a polymer impregnated or an epoxy impregnated composite.

19. The sole of any one of claims 10, 11 or 18 wherein the heel also includes a first upper portion of one or more layers of woven aramid fibre. 20. The sole of claim 19 wherein the first upper portion is comprised of three layers of woven aramid fibre.

21. The sole of claim 19 or 20 wherein the corrugated layer does not extend outwardly to the periphery of the first upper portion but instead extends to a position inwardly from the periphery with the gap between the periphery of the inner portion and the periphery of the corrugated layer being substantially identical about the periphery of the heel.

22. The sole of claim 21 wherein the gap between the periphery of the first upper portion and the periphery of the corrugated layer is about 7mm.

23. The sole of any one of claims 10 and 11 and 18 to 22 wherein the fore plate is resiliently flexible.

24. The sole of claim 23 wherein the fore plate includes a first upper portion of one or more layers of woven aramid fibre.

25. The sole of claim 24 wherein the first upper portion of the fore plate is comprised of three layers of woven aramid fibre.

26. The sole of any one of claims 23 to 25 wherein the corrugated layer is positioned in the fore plate immediately below its first upper portion.

27. The sole of claim 26 wherein the corrugated layer is a layer of corrugated polymer impregnated composite.

28. The sole of any one of claims 23 to 27 wherein the corrugated layer in the fore plate does not extend outwardly to the periphery of its first upper portion but instead extends to a position inwardly from the periphery with the gap between the periphery of the inner portion and the periphery of the corrugated layer being substantially identical about the periphery of the fore plate.

29. The sole of claim 28 wherein the gap between the periphery of the first upper portion and the periphery of the corrugated layer in the fore plate is about 7mm.

30. The sole of any one of claims 23 to 30 wherein the corrugated layer in the fore plate is adhered with epoxy resin to the first upper portion in the fore plate.

31. The sole of claim 30 wherein the corrugated layer is stitched to the first upper portion of the fore plate.

32. A sole for an article of footwear adapted to offer a level of protection to the foot of the wearer of the footwear if the wearer inadvertently triggers an explosive device, the sole having a longitudinal axis and including a plurality of channels extending transversely to the longitudinal axis, each of the channels being adapted to channel blast gases, generated when the explosive device is triggered, laterally away from the foot of the wearer.

33. The sole of claim 32 wherein the channels are provided in the sole by the provision of at least one corrugated layer of blast-resistant layer having the features of any one of claims 2 to 31.

34. The sole of any one of the preceding claims wherein the sole includes an additional layer of blast-resistant material disposed proximate the upper surface of the sole.

35. The sole of claim 34 wherein the additional layer comprises a plurality of layers of woven aramid fibre.

36. The sole of claim 35 wherein the additional layer comprises at least fifteen layers of woven aramid fibre.

37. The sole of any one of claims 34 to 36 wherein the sole includes a still further layer of blast-resistant material disposed below the additional layer of blast-resistant material.

38. The sole of claim 37 wherein the still further layer comprises at least one layer of woven aramid and at least one layer of woven ceramic fibre.

39. The sole of claim 38 wherein the still further layer comprises a plurality of alternating layers of woven aramid and woven ceramic fibre.

40. The sole of claims 38 or 39 wherein the woven ceramic fibre layer is the bottommost layer of the still further layer of blast-resistant material.

41. The sole of claim 39 wherein the further layer include two layers of woven aramid fibre alternately layered with two layers of woven ceramic fibre, and further wherein one of the woven ceramic layers is the bottommost layer of the still further layer.

42. The sole of any one of the preceding claims wherein the sole includes a bottommost ground-engaging layer.

43. The sole of claim 42 wherein the ground-engaging layer is formed from rubber or polyurethane.

44. The sole of claim 43 wherein the ground-engaging layer is formed in two layers, an outermost layer and an inner layer.

45. The sole of claim 44 wherein the outermost layer is a nitrile rubber and the inner layer is a foam rubber.

46. An article of footwear including a sole according to any one of the preceding claims.

47. The article of footwear as defined in claim 46 wherein the article includes a cocoon of substantially blast-resistant material that is incorporated into the footwear, the cocoon having a sole and an upper such that the cocoon would substantially or entirely surround the foot of a wearer of the article of footwear.

48. The article of footwear of claim 47 wherein the upper is formed from an outer layer and an inner layer between which the cocoon is positioned.

49. The article of footwear of claim 47 or claim 48 wherein the cocoon includes at least two layers of woven aramid fibre.

50. The article of footwear of any one of claims 47 to 49 wherein the cocoon comprises a sandwich of layers of woven ceramic fibres or woven ceramic/glass-ceramic composite fibres and aramid fibres.

51. The article of footwear of any one of claims 47 to 50 wherein the sole is stitched about its periphery to the cocoon.

52. A method for forming a metal matrix composite material, wherein the composite is formed from woven or chopped graphite, the method including the steps of:

impregnating the graphite with a polymer containing a metal powder;

drying the graphite;

passing the graphite through a molten bath of metal alloy that is at a temperature to carburise the polymer and so form the composite material; and

exerting pressure on the composite material to remove excess metal alloy therefrom.

53. The method of claim 52 wherein the composite is formed from woven or chopped graphite and a ceramic material.

54. The method of claims 52 or 53 wherein the woven graphite is of the type 3K TOW, 380g/m^2, M60/T300.

55. The method of any one of claims 52 to 54 wherein the polymer comprises either a polymer solution or molten polymer..

56. The method of any of claims 52 to 55 wherein the metal powder is formed from a metal alloy.

57. The method of claim 56 wherein the metal alloy constitutes at least 20% w/w of the polymer.

58. The method of claim 57 wherein the metal powder is formed from an alloy including aluminium, nickel and molybdenum.

59. The method of any one of claims 52 to 58 wherein the step of drying the graphite comprises passing the graphite through an electric furnace.

60. The method of any one of claims 52 to 59 wherein the molten metal alloy is formed from an alloy of aluminium, nickel and molybdenum.

61. The method of any one of claims 52 to 60 wherein the step of exerting pressure on the composite material comprises passing the composite through a set of rollers that are capable of exerting about 35 to 40 tons of compression and which squeeze out substantially all excess metal alloy from the composite material.

62. A method for forming a metal matrix composite material, wherein the composite is formed from woven or chopped graphite, the method including the steps of:

impregnating the graphite with a molten polymer containing a high temperature alloy powder;

drying the impregnated graphite; and

rolling the impregnated graphite in a set of rollers to form a rolled composite material.

63. The method of claim 62 wherein the composite is formed from woven or chopped graphite and a ceramic material.

64. The method of claims 62 or 63 wherein the woven graphite is of the type 3K TOW, 380g/m^2, M60/T300.

65. The method of any of claims 62 to 64 wherein the high temperature alloy is a titanium or nickel alloy.

66. The method of claim 65 wherein the metal alloy constitutes up to about 50% w/w of the polymer.

67. The method of any one of claims 62 to 66 wherein the step of drying the graphite comprises passing the graphite through an electric furnace.

68. The method of any one of claims 62 to 67 wherein the step of exerting pressure on the impregnated graphite comprises passing the graphite through a set of rollers that are capable of exerting about 35 to 40 tons of compression.

69. The method of any one of claims 52 to 68 wherein a metal is applied to the composite material to provide excellent bonding of the material.

70. The method of claim 69 wherein the metal is titanium, beryllium or a metal alloy.

71. The method of claim 70 wherein the metal is applied by plasma spraying or hot sheet pressing.

72. A metal matrix composite material formed using the method of any one of claims 52 to 71.